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ABSTRACT

A study was designed to develop an instrument and methodological procedure to assess transitive relations within seriation problems in elementary school children using three criteria: explanations, judgments, and strategies. A secondary analysis to assess transitivity used the three criteria according to whether the children were conservers, in transition, or nonconservers of length. The instrument and methodology were developed from a Piagetian perspective. Each of the Kindergarteners, first and second graders participated in eight seriation tasks involving two sets of seriated rods, one set that varied in color and one set that was red. The one red rod from the array of colored rods was designated as the child's stick and placed within the second array of rods, behind a screen. Every child had to engage in the mental operations necessary to solve the problem of finding his red rod. Results indicate that children's explanations and strategies provide a richer data source than just judgments, for the comparison of performance at different grade levels. (CS)

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Transitive Inferences within Seriation Problems Assessed by Explanations, Judgments, and Strategies

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Running head: Seriation Problems

Abstract

The development of transitivity within seriation problems was assessed by explanations, judgments, and strategies. Eight seriation tasks were presented to 88 male kindergarten, first, second, and third graders. Each task consisted of two sets of seriated rods, one that varied in color and one set that was red. The one red rod from the array of colored rods was placed within the second array of red rods, behind a screen. Each child had to find his red rod. Six levels of strategy and explanation were obtained. Significant mean explanation differences were obtained for the kindergarten and third grade comparison and the first and third grade comparison. No significant mean differences among grades were obtained for the judgment measure. Significant mean strategy differences were obtained between kindergarteners and third graders. The use of explanations and strategies seems to make available a richer data source for the comparison of performance at different grade levels as compared to studies that use only the judgment criterion.

Transitive Inferences within Seriation Problems Assessed by Explanations, Judgments, and Strategies

Historically, in the assessment of transitivity two different criteria have been used; this has resulted in contradictory age norms for the presence of transitivity and confusion regarding the actual phenomenon being assessed. For instance, Braine's (1959, 1962, 1964) criterion for the presence of transitivity was based on judgments. However judgments, combined with adequate explanations, were used as the criteria by Smedslund (1963, 1965, 1966, 1969), as well as by Inhelder and Piaget (1964).

An additional measurement criterion may be useful for assessing performance that might provide additional insight into a child's reasoning abilities. That is the examination of the development of the transitive relation within seriation problems through the assessment of a child's strategy. The study of children's strategies, the particular movements, actions, manipulations and transformations a child makes, may provide additional knowledge of seriation and asymmetrical transitivity beyond that obtainable from the judgment or explanation criteria alone.

Bruner (1973) has stressed the importance of assessing children's strategies in concept acquisition. Bruner has externalized for observation many of a child's decisions to determine whether regularities in these decisions can provide insights about the processes involved in

concept attainment. A regularity in decision making is called a strategy or a "pattern of decisions in the acquisition, retention, and utilization of information that serves to meet certain objectives" (p. 135). A strategy does not necessarily refer to a conscious plan, but is inferred from a pattern of decisions the investigator observes in a child. Thus, in addition to examining children's explanations and judgments, the strategies they employ in solving seriation problems may enrich our understanding of the development of transitivity and seriation.

In addition to transitive inferences having been assessed by different criteria, two schools of thought have attempted to assess that same phenomenon by different procedures. One position has been the study of transitive inferences from a Piagetian perspective (e.g., Moore & Gallagher, 1973; Moore, 1977; Youniss & Murray, 1970; Youniss & Dennison, 1971; Youniss & Furth, 1973; Youniss, 1975). For instance, Youniss (1975) viewed transitivity from a Piagetian perspective in which the inference is a function of the child's operational capacity and is considered as an indicator of operational competence in the child (Falmagne, 1975). The second position has been the study of transitive inferences from a syllogistic or propositional perspective (e.g., Bryant & Trabasso, 1971; Riley & Trabasso, 1974; Trabasso, Riley & Wilson, 1975). For instance, Trabasso et al. (1975) described a process in which the information in the premises is mapped into an imaginal model from which the conclusion of the syllogism can be subsequently read off (Falmagne, 1975).

Although procedural differences have existed between the two positions regarding how transitive inferences are to be assessed, both positions

have seemed consistent in defining what transitive inferences are. For instance, Youniss (1975) stated:

> Transitivity enters into this relational structuring when the passage among three terms in a series is understood. A particular term in the series is no longer viewed as having a one-way relation but is recognized as bearing on two directions simultaneously. For example, term B is seen as being taller than term A and shorter than term C. In effect B has the character of a middle term. More generally, each term in a series is recognized as a potential middle term since it is taller than all items preceding it and shorter than all terms that follow. (p. 234)

Trabasso's et al. (1975) criterion for transitivity also seemed consistent with the previous statement by Youniss:

> Success on the task is used to decide whether . . . he can coordinate the terms A and C via the middle term B, whether he appreciates the reversible nature of the order (e.g., A > B implies B < A), and whether he can seriate long series of these asymmetrical, transitive relations. (p. 202)

Thus the common focus of the two perspectives regarding transitivity seems to have centered on the importance of the middle term B. That is, an understanding and use of the bidirectional nature of the middle term has been used as the common criterion in concluding that a child has acquired the transitivity concept.

As a result of the criterion concern and the different procedures used to assess transitivity, one purpose of the present study was to

develop an instrument and methodological procedure to assess transitive relations within seriation problems in children using the three criteria: explanations, judgments, and strategies. The instrument and methodological procedure was developed from a Piagetian perspective. Following instrument development, the main purpose of the study was to assess the acquisition and development of transitivity within seriation problems in elementary school children through the use of these three measures.

In addition, a Piagetian conservation of length assessment was also given the children to differentiate conservers from nonconservers of length. Thus, a secondary analysis was conducted to assess transitivity within seriation problems using the three criteria according to whether the children were conservers, in transition, or nonconservers of length.

Method

Sample

The tasks to measure the transitive relation within seriation problems were administered to a sample of 88 male children in a suburban middle-class elementary school. The sample was a stratified random selection from sixteen classrooms, four at each grade level from kindergarten through third grade. Thus, 22 children were drawn from each grade level. Sample size was determined following Winer's (1962) procedure. With a moderate effect size and a .05 significance level, a sample size of 22 gives a power of .90. Age ranged from 65 months to 122 months with mean ages of 72.4, 82.4, 95.6 and 109.5 for the four grades.

Instrumentation

Each of the eight seriation tasks comprised two sets of sticks that differed in their seriated order in length by .375 of an inch (9.53 mm). For the first set, each stick also varied in color while for the second set, all sticks were the same color, red. The set of different colored sticks was placed in front of each child on his left. The one red stick from this different colored arrangement of sticks was the child's stick; it was 8 inches (203.2 mm) in length. A card with the word "mine" with an arrow (↓) underneath it, written in red ink, was placed above his stick. It was placed out of the way of the child's actions. The child's stick was then taken from the seriated array of colored sticks and placed within the second array of sticks of the same color, behind a screen on the child's right. The child was instructed that "the name of the game was to

find his stick" and that he could do anything in order to find his stick. The screen was then removed and the child had to find his red stick from the array of red-colored sticks on his right. The initial arrangement of different colored sticks, except for the absence of his stick, remained in front of the child. Once a child chose a stick as his, he was asked, "Is this your stick?" and "Why?" "How do you know?"

Each of the eight tasks took approximately one to three minutes to complete; assessment time ranged between 8 and 24 minutes per child. For each task, the relative position and relative length of the child's stick was randomly varied. Of the eight seriation tasks, two tasks each of 3, 5, 7 and 10 rods comprised each series. A green and a blue stick were the two on either side of the red stick, smaller and bigger respectively.

Inter-rater reliability was obtained from four judges, including the investigator, on the scoring of observed strategies and explanations. For strategy total score, intercorrelations among judges ranged from .79 to .94 and their median was .88. For explanation total score, intercorrelations ranged from .75 to .92 and their median was .83.

The internal consistency of the test was calculated through the use of the alpha reliability coefficient within each grade and for the total group (Stanley, 1971). The coefficients were quite high; for all grades combined (N = 88), alpha coefficients of .98, .97 and .90 were obtained for the three criteria (strategy, explanation and judgment).

Task Scoring Procedure

For level of strategy and level of explanation, for each of the eight tasks the scoring procedure was a behavioral categoriation. The scoring system was derived empirically from the realm of possible responses

actually made by children from this study and an earlier pilot study (Moore & Gallagher, 1973). The scoring system presented also has been replicated independently by Pulaski (Note 1). Strategies were scored on a 0 to 5 point scale as follows for each task:

0 - No comparison: Selection of red rod with no comparision of colored reference rods, e.g., points to a stick.

1 - Pseudosingle comparison: Comparison of the chosen red rod with only one colored reference rod; confirmation of chosen red rod as his rod made perceptually without the use of a point of reference; e.g., holds green stick next to red one lying on table and looks at them, doesn't even then with thumb or stand on edge of table to confirm comparison.

2 - Simple Single Comparison: Comparison of the chosen red rod with only one colored reference rod; systematic use of a point of reference; e.g., sets blue stick on end on the table and compares to red one on end on table.

3 - Pseudodouble Comparison: A random comparison of chosen red rod with any two reference rods; no use of a point of reference; perceptual confirmation of red rod; e.g., holds blue and yellow sticks on either side of red one and looks at them.

4 - Double Comparison: A systematic comparison of the chosen red rod with two reference rods on each side; systematic use of a point of reference; e.g., red stick is placed between green and blue one, pushed together and evened with

thumb, finger or hand.

5 - Seriation With Double Comparison: A systematic comparison of the chosen rod with all reference rods to eliminate all possibilities; systematic incorporation of measurement with a reference point; e.g., all red sticks are eliminated as possibilities by placing each red stick, one at a time, between green and blue one, pushed together and evened with thumb, all remaining colored sticks may or may not be pushed together and evened with the green, red, and blue sticks.

Similarly, level of explanation was scored on a 0 to 5 point scale as follows for each task item:

0 - No Comparison: Explanation of chosen red rod not including any comparison to colored reference rods but rather based on irrelevant perceptions, "intuitions" or contradictory information; e.g., "It's mine, it's in the same position as mine was." or "It's red like mine was."

1 - Pseudosingle Comparison: Explanation of chosen red rod based on comparison with only one colored reference rod; perceptual confirmation of chosen rod; e.g., "It's my stick, it's the same size as the green one," (the red one is actually either larger or smaller than it).

2 - Simple Single Comparison: Explanation of chosen red rod based on comparison with only one colored reference rod; systematic

use of a point of reference; e.g., "It's mine, I measured it and it's larger than the green one," (the red one may also be larger than the blue one instead of smaller).

3 - Pseudodouble Comparison: Explanation of chosen red rod based on random comparison with any two colored reference rods; no use of a point of reference; perceptual confirmation of chosen red rod; e.g., "This one is mine, it's bigger than the white one and smaller than the blue one," (the red one is still not bigger than the green stick).

4 - Double Comparison: Explanation of chosen red rod based on a random comparison with two reference rods on each side; non-systematic use of a point of reference in explanation; e.g., "It's bigger than the green one and smaller than the blue one."

5 - Seriation With Double Comparison: Explanation of chosen red rod based on a systematic comparison; systematic incorporation of measurement; e.g., "This one is mine. It's bigger than the green one, which is bigger than all of the [the stick(s) smaller than the green one] and mine is bigger than them, but smaller than the blue one and all these [the stick(s) larger than the blue one]. I know 'cause I measured them and looked at them."

The judgment response was scored either as a 0 or 1 for each task:

0 - Unsuccessful final selection of the child's stick irrespective of strategy or explanation used.

1 - Successful final selection of the child's stick irrespective of strategy or explanation used.

Analysis of responses revealed the above six strategies and explanations which made up six steps toward the acquisition of the asymmetrical transitive relation with seriation problems.

In addition, a Piagetian conservation of length assessment was also given the children to differentiate conservers from nonconservers of length (Piaget, Inhelder, & Szeminska, 1960). The procedure for the rod length assessment follows. The child chose two rods of equal length, 8 inches (203.2 mm) from a group of four rods; the other two rods were 6 (152.4 mm) and 10 inches (254.0 mm) in length. After he confirmed the equality of the two eight-inch rods, they were placed parallel to each other, about 4 inches apart. First the investigator moved one rod 4 inches to the subject's right. For the next shift, the other rod was moved 4 inches to the left. After each shift of rods, the child was asked: "Are the rods the same length or equal now?" and followed by: "Why? How do you know?" Between each transformation, the sticks were returned to equality. Counter-suggestions were presented by the investigator if a child vacillated in his responses. Scoring of responses was made by the following classification procedure: 0 - nonconserver, 1 - transitional and 2 - conserver.

Statistical Analysis

For all analyses, the dependent variables were total scores across the eight tasks for the three measures: strategy, explanation and judgment. The main analysis was a four group multivariate analysis of vari-

ance (MANOVA). The independent variable consisted of four grade levels: kindergarten; first; second; and third grade. The secondary analysis was a three group MANOVA. The independent variable was conservation of length as indicated by membership in one of the three categories: non-conserver, transitional, and conserver.

Additional analyses for the MANOVA results also were computed. An Eta Square was obtained for each of the three criteria to determine which measure accounted for the largest percentage of variance among each group (Cooley & Lohnes, 1971, p. 234). A Scheffe' test for multivariate multiple comparison also was obtained (Morrison, 1968, p. 183-185).

Results

Means and standrad deviations for the three criteria are presented in Table 1. Mean scores increased from kindergarten through third grade for the strategy, explanation, and judgment measures. Raw score means for the four grade levels were inspected and were observed to vary independently of variances for each dependent variable. The assumption of equality of dispersion was met, F (18, 2934) = .83, $p > .05$. Since the above conditions existed, no transformation will make data more suitable for analysis (Kirk, 1968, p. 64).

Insert Table 1 about here

The set of observed criteria significantly separated the four grades, Wilks Lambada = .71, F (9, 199) = 3.35, $p < .001$. The corresponding univariate post-hoc F test and Eta Square for the three criteria are presented in Table 2. Strategy total score significantly, F (3,84) = 4.71,

$p < .004$ discriminated among the four grades and accounted for 14% of the variance among the grades. Explanation total score also discriminated significantly, F (3, 84) = 7.5%, $p < .001$, among the four grades and accounted for 21% of the variance. Judgment total score did not significantly discriminate F (3, 84) = 1.6%, $p > .18$, among the four grades but accounted for 6% of the variance. The three measures also were subjected to analysis simultaneously; the generalized-proportion of variance which they explained was 29% (MANOVA Eta Square = .289).

Results of the Scheffe post-hoc test at the .10 significance level for multivariate multiple comparisions (Morrison, 1968, p. 183-185) of the four grade levels for each criteria were obtained. Significant mean strategy differences were obtained for the kindergarten and third grade comparison and significant mean explanation differences were obtained for the kindergarten and third grade comparison and the first and third grade comparison. No significant mean differences among grades were obtained for the judgment variable.

Means and standard deviations for the nonconserver (N = 52), the transitional (N = 10), and the conserver (N = 26) are presented in Table 2 for the three criteria. The assumption of equality of dispersions was not met, F (12, 3172) = 1.8%, $p < .05$. With an unequal number of subjects in each of the three groups the results of this analysis should be interpreted with the qualification that the assumptions for the use of the MANOVA may be violated, even though the test for the discrimination among groups is fairly robust under departures from its assumptions

(Cooley and Lohnes, 1971, p. 228).

Insert Table 2 about here

The three criteria significantly separated the three groups, Wilks Lambada = 0.7464, F (6, 166) = 4.36, $p < .001$. The three measures also were subjected to analysis simultaneously; the generalized proportion of variance among the groups which they explained was 25% (MANOVA Eta Square = .2536). All three measures significantly discriminated among the three groups: strategy, F (2, 85) = 8.81, $p < .001$; explanation, F (2, 85) = 12.35, $p < .001$; and judgment, F (2, 85) = 5.51, $p < .005$. The explanation total score variable accounted for 23% of the variance among the three groups; strategy and judgment total scores accounted for 17% and 12% respectively, of the variance among the three groups.

Results of the Scheffe post-hoc test at the .10 level of significance for multivariate multiple group comparisons for each criteria also was calculated. A significant mean difference was obtained for the nonconserver and conserver of length comparison for each of the three criteria: explanation, strategy, and judgment. Percentages of type of strategy and explanation used by each grade level is presented in Table 3.

Insert Table 3 about here

Discussion

The typical strategy (64%) of the kindergarten children was to make no comparison of their red rod with any of the colored reference

rods. The children would simply point to a red rod as theirs or grab a red rod and indicate it was their stick. Some of these children instead of comparing the red rod with the colored reference rods, would compare various red rods with each other and then randomly select one. These children seemed similar to some children in Piaget's (Piaget et al., 1960) tower experiment, who did not consider moving the objects but used only a perceptual comparison.

In contrast to the kindergarteners, the third graders exhibited more advanced strategies in searching for their stick. Forty-five percent of the third graders made at least one systematic comparison of a red rod with the two colored reference rods that were ordered on either side of the position in the series where the child's stick was. In addition, they made a systematic use of a reference point to measure the relative lengths of the rods. For instance, some children took a red stick, placed it between the green and blue one, and stood all three sticks on end to compare their lengths.

The behavior characteristic of the third grade children was one in which operativity was evident. The operational behavior implied by the child's actions was that any given object can, at the same time, be both larger than the preceding rods and smaller than the succeeding ones. According to Inhelder and Piaget (1964), this level of behavior seems to occur when intuitions, initially perceptual, as evidenced by the strategy performance of the kindergarten child, become true operations.

The explanation variable, like the strategy variable, was significant. The typical explanation used by kindergarten (73%) and first grade children (59%) to explain their selection of a stick was a justification that did not include any comparison of the red rod to the colored reference rods. The explanations used by these children seemed to be based on perceptions and intuitions that did not seem to facilitate their finding a solution to the problem task. For instance, some children gave the following as a reason why a particular red rod was their stick: "It's mine, it's in the same position here as mine was there," or "It's mine, it's red like mine was."

At this level of explanation the children appeared to be making a correspondence with the set of colored rods and the set of red rods. For instance, in the first explanation above, the child appeared to be making a correspondence between the position or order of his red rod embedded in the order of colored reference rods with the same position or order in the set of red rods. Therefore, the child would have selected the red rod that was in the same position in the order of red rods as his red stick was in the set of colored rods and state, "It's mine, it's in the same position here as mine was there," as support for the child's belief that that stick was indeed his.

Another correspondence the children made was based on color. For instance, some children would randomly grab a red stick as theirs and support the decision by saying, "It's red like mine was." This explan-

ation is difficult to understand, since the remaining rods from which the child could choose were also all red. In an earlier pilot study (Moore & Gallagher, 1973) that explanation was also given several times by children. Each time this occurred the child was asked, "How about the other rods here, they're also red?" The modal response that was given by the children was, "I know, but mine is red." A possible explanation might be that the children were trying to make a fine color discrimination among the red sticks in order to find their stick. If not, then the children were presenting an explanation that was not consistent with their perception. The color response was an explanation that did not result in any cognitive strain on the child's part. Thus, the child did not have to attempt to repeat an event that he was unable to do. Also, the child may not have had the appropriate language or vocabulary skills to explain his response.

As compared to the modal responses of the kindergarten and first grade children, the responses of the third grade children presented more complete and elaborate explanations as to why a particular chosen red rod was their stick. Approximately 45% of the third grade children explained that a chosen red rod was theirs by considering the two colored reference rods adjacent to their own rod and stating that a point of reference for measurement was used to confirm the red stick as their own. For instance, one child justified his selection by explaining, "It's bigger than the green one, which is bigger than all of

then [the sticks smaller than the green one] and mine is bigger than them, but smaller than the blue one and all these [the sticks larger than the blue one]. I know 'cause I measured them and looked at them."

What is important in such explanations is the coordination between successive actions that replaces the one-directionality inherent in a set of rods. As Inhelder and Piaget (1964) explained, the development of seriation involves the ability of the child to coordinate successive actions with real objects with their multiplicity of relations.

Thus, the process of development that children seemed to progress through as one moved from kindergarten to third grade initially involved the child presenting reasons based on correspondences, to reasons involving the one-directionality of the rods, to reasons that reflect the coordination of his multiplicative actions. In the use of reasons based on correspondences, children were discovering the similarities and commonalities of the task situation. But focus on the similarity of objects not pertinent to the tasks makes it difficult for the child to engage in the mental operations necessary to solve the problem, i.e., finding his stick. It then becomes necessary for the child to engage in the manipulation of the objects but that manipulation initially involves the one-directionality of the rods, i.e., single comparisons, and only later does the child engage in double comparisons and seem to understand that the rods have a dual relationship. As Piaget (Note 2) stated, in the development of correspondences

a child discovers the closest similarities between any two objects in lieu of their differences while for the evolution of transformations a child must acquire reversibility. That is, the mental operation is inferred from the child's actions which in the case of the development of asymmetrical transitive relations within seriation problems involves the child's ability to understand the dual relationship of his stick whereby it can, at the same time, be both longer than some sticks and shorter than others.

In addition to children's responses having differed according to whether they included the two adjacent colored rods in their explanations, they also differed in using a reference point for measurement to confirm their comparisons. In the case of single comparisions, approximately 10% of the children perceptually compared the relative lengths of the two rods, while approximately 11% of the children stood the two rods on end on the table to compare lengths or evened the two rods, lying flat, with their hand or thumb. In addition, in the case of the children making double comparisons of sticks, approximately 17% perceptually compared the relative lengths of the three sticks while approximately 9% incorporated the use of a reference point for measurement.

The use of a measurement point was important for the successful completion of each task, i.e., finding his stick. Whether a child used single or double comparisons, if he did not systematically use a reference point, errors in correctly selecting his stick were likely,

since the rods in their seriated order only differed by .375 of an inch.

The absence of significant differences among grades for the judgment criterion does not seem to support the view (e.g., Brainerd 1973, 1974) that judgments are to be preferred over explanation criteria in the analysis of Piagetian-based tasks. In addition, the process approach in the present study provides a richer data source for the comparison of performance at different grade levels as compared to studies that use the judgment criterion. In a comment on Brainerd's criterion for cognitive structures, Reese and Schack (1974) contend that irrelevant hypotheses may be eliminated by the explanation criterion and thus, both criteria should be studied. The present study, using a procedure which permitted separate analyses, was able to examine strategies in addition to judgments and explanations. Youniss (1975) has suggested that more studies are needed in order to investigate the strategies used by individuals in reaching logical conclusions in cognitive tasks.

For the analysis according to level of conservation of length performance, the measures significantly separated the three groups. A significant mean difference was obtained for the nonconserver and conserver of length comparison for each of the three criteria.

In this analysis, what is evident is that the explanation criterion accounted for a larger percent of the group variance as compared to the strategy or judgment criteria. This relationship between the explanation criterion and level of conserver performance may be ex-

plained by the nature of the scoring assessment for both measures. For the conservation of length measure, performance is primarily assessed by the child's verbal responses to questions of the type, "Why?" "How do you know?" The assessment of the explanation criterion for the present study was also based on similar verbal responses. Thus the increase in group variance accounted for by the explanation criterion as compared to the strategy or judgment criteria in explaining conservation performance may be due to that relationship, i.e., similar assessment of performance.

As compared to the previous main analysis, in which the judgment criterion did not significantly separate the groups, in this analysis by conservation of length performance, the judgment criterion did significantly discriminate among the groups. The conserver and nonconserver mean group comparison yielded a difference of 2.19 points. The relationship between conservation of length and seriation may explain why the judgment criterion was significant for this analysis, while it did not separate the groups for the main analysis by grade. That is, the transitive relation within seriation problems may be more closely related to conservation than to grade. Further inquiry into the relationship between the three criteria and conservation of length, as well as other measures, is necessary.

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Footnote

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TABLE 1

Mean and Standard Deviation for Three Criteria by Grade Level

	Explanation		Judgment		Strategy	
Grade	M	SD	M	SD	M	SD
Kindergarten	3.59	8.29	2.73	2.45	6.95	11.15
First	7.09	12.13	2.64	2.63	9.82	13.36
Second	12.00	13.13	3.32	2.78	12.41	13.53
Third	19.45	12.78	4.04	3.55	20.77	13.30

Note. The number of children at each grade level was 22. The range of scores was 0-40 for explanation and strategy, and 0-8 for judgment.

TABLE 2

Mean and Standard Deviation for Three Criteria

By Level of Conservation of Length

Level of	Explanation		Judgment		Strategy	
Conservation	M	SD	M	SD	M	SD
Nonconserver	5.52	9.01	2.27	2.39	7.81	10.63
Transitional	14.90	15.39	3.50	3.21	18.60	15.74
Conserver	18.88	14.31	4.46	3.30	19.50	14.80

Note. The number of children classified into the three conservation levels was: 52, 10, and 26, respectively.

TABLE 3

Frequency Distribution and Percentages of Explanation and Strategy Responses by Grade Level

Total Score	GRADE K N	K %	1 N	1 %	2 N	2 %	3 N	3 %
EXPLANATION								
0	16	72.7	13	59.1	8	36.4	3	13.6
1-8	3	13.6	3	13.6	3	13.6	3	13.6
9-16	0	0.0	2	9.1	5	22.7	3	13.6
17-24	2	9.1	1	4.5	2	9.1	3	13.6
25-32	1	4.5	1	4.5	1	4.5	6	27.3
33-40	0	0.0	2	9.1	3	13.6	4	18.2
STRATEGY								
0	14	63.6	11	50.0	8	36.4	3	13.6
1-8	2	9.1	2	9.1	3	13.6	2	9.1
9-16	2	9.1	3	13.6	3	13.6	2	9.1
17-24	3	13.6	3	13.6	4	18.2	5	22.7
25-32	0	0.0	1	4.5	2	9.1	5	22.7
33-40	1	4.5	2	9.1	2	9.1	5	22.7